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THE GENERAL BIOLOGY COURSE AND THE TEACHING OF ELEMENTARY BOTANY AND ZOOLOGY IN AMERICAN COLLEGES AND UNIVERSITIES[1]

THE general biology, or elementary biology, course originated with Huxley about fifty years ago and was introduced into this country by the physiologist, H. Newall Martin, one of Huxley's earlier students. In the introduction to Huxley and Martin's little text-book on Elementary Biology, Huxley states as his conviction "that the study of living bodies is really one discipline, which is divided into zoology and botany simply as a matter of convenience"; that "sound and thorough knowledge is only to be obtained by practical work in the laboratory"; and, further, that through the study of a series of selected animals and plants "a comprehensive, and yet not vague, conception of the phenomena of Life may be obtained, and a firm foundation upon which to build up special knowledge will be laid." A more recent text-book (Sedgwick and Wilson's "General Biology") states that general biology "deals with the broad, characteristic phenomena and laws of life as illustrated by the thorough comparative study of a series of plants and animals taken as representative types."

In the average general biology course the laboratory material is selected more or less indiscriminately from both the plant and the animal kingdoms, but with animal material greatly preponderant. The study of animals thus alternates with the study of plants: now a few animals and then a few plants. The aim of such a course is not so much to bring out the fundamental characteristics of plants as plants and of animals as animals, but rather to demonstrate that the two are merely different expressions of matter in the living

[1] Contribution from the Osborn Botanical Laboratory.

state and that the same broad underlying biological principles are applicable to both. Indeed there are some teachers who become so inspired with the idea of biology as the study of *living organisms* and with the prime importance of *underlying biological principles* that their students, pondering over the vague structures and intangible phenomena of a mysterious microscopic world, are led to lose sight completely of the fact that, after all, it is *plants* and *animals* they are dealing with—something they have been familiar with all their lives.

There are some botanists and zoologists to whom a general biology course means something quite different from what has just been described. It means two virtually independent, but consecutively arranged and more or less closely coordinated courses, the one in plant biology or elementary botany, and the other in animal biology or elementary zoology: these two, alike in their pedagogical objects but different in their material, being grouped together for educational or administrative purposes. But this is *not* the sort of a general biology course with which the present article deals. We are concerned rather with the first-mentioned type—the type which, in no small degree at any rate, has been responsible for the popular delusion that biology is the study of animals: that the words *biology* and *zoology* are synonymous.

Through the influence of Martin and his students general biology obtained a rather strong foothold in this country. It has been widely adopted by the high schools and was given a place in the curricula of many colleges and universities. Abroad, however, so far as the higher institutions of learning are concerned, it was not so favorably received. "In the universities of Britain, Germany and in most cases of France," according to a prominent American botanist, "a biology course has never been admitted or regarded as of sufficient thoroughness." And even in our own country, as will be pointed out in detail presently, the number of institutions of college grade which offer a course in general biology has diminished greatly in recent time. To use the picturesque phraseology of a noted contemporary botanist: general biology "is a kind of course introduced years ago by the Huxley and Martin book and discarded when botany became strong enough to stand on its own legs."

For a number of years it has been the conviction of the writer that a course in general biology of the type specified above ought not to be offered to elementary students, either as a cultural study or in preparation for more advanced work in botany or zoology. It has seemed particularly undesirable that in an institution having both a department of botany and a department of zoology such a course should be given by one department alone. With a view to ascertaining certain facts and securing a consensus of opinion regarding certain relevant problems, a questionnaire on this subject was recently submitted to 105 botanists, representing 67 colleges and universities, and to 65 zoologists, representing 49 similar institutions. Replies have been received from 86 botanists and 46 zoologists, representing altogether 66 institutions. The present article, in the main, is based on these replies and on a series of 19 letters relating to similar problems which was secured a number of years ago and courteously loaned to the writer by Professor Margaret C. Ferguson, of Wellesley College. To a very large extent the writer has acted merely in the capacity of editor or compiler in adapting and coordinating the various individual expressions of opinion set forth in these communications. Although quotation marks are seldom used, much of the subject matter in this paper has been quoted verbatim or with slight modification. For obvious reasons neither individuals nor institutions are referred to by name.

For present purposes American colleges and universities may be divided more or less naturally into two classes: *Class A*, those which maintain distinct departments of botany and zoology; and *Class B*, those in which both botany and zoology are under one head, the department of biology. Among the institutions investigated by the questionnaire, 47 of those heard from belong to class A, 19 to class B. Of those belonging to class A there

are only 6 which at the present time offer a course in general biology,[2] while among those of class B there are no less than 14 that give such a course. It is thus apparent that, among colleges, the giving of a general biology course is largely restricted, at the present day, to institutions which do not have distinct departments of botany and zoology. Of the institutions of this character investigated, 74 per cent. give such a course, and it is probable that this proportion would be considerably higher if the multitudinous smaller institutions not investigated were taken into account. Among the institutions which maintain distinct departments of botany and zoology, less than 13 per cent. of those investigated by questionnaire give such a course, and this proportion doubtless would be considerably lower if account were taken of various agricultural colleges and other institutions not included in the canvass. This disparity in itself is significant. But it is even more significant that, as was developed upon investigation, among the 41 institutions in class A which do not at the present time give a course in general biology there are no less than 21 which have given such a course in former years but have abandoned it. In other words, among the institutions included in this category, during the last twenty-five years *there has been a decrease of nearly 80 per cent. in the number which give a course in general biology.*

Some of the questions asked in the questionnaire, together with the expressions of opinion they called forth are as follows:

1. Is it your opinion that a course should be offered in general biology, complete in itself, so far as it goes, and necessarily overlapping more advanced courses in both botany and zoology: a course designed primarily for its educational value to the student who probably will pursue no further work along biological lines?

Replies.—Botanists: Class A, *No* (46:16); Class B, *Yes* (8:3). Zoologists: Class A, *Yes* (20:14); Class B, *Yes* (11:0).

2. If such a course is given, should it be made a prerequisite to more advanced courses in botany and zoology, or should it be treated as an entity in itself and be disregarded in arranging the regular courses of study in botany and zoology.

Replies.—Botanists: Class A, *an entity* (36:15); Class B, *an entity* (8:4). Zoologists: Class A, *an entity* (14:12); Class B, *a prerequisite* (8:1).

3. Is it your opinion that some sort of an elementary course in general biology is a desirable prerequisite to all courses in either botany or zoology? Should it be made an obligatory prerequisite?

Replies.—Botanists: Class A, *not obligatory* (51:9), and *not desirable* (47:13); Class B, *not obligatory* (8:4), and *not desirable* (7:5). Zoologists: Class A, *not obligatory* (21:10), and *not desirable* (19:14); Class B, *both obligatory* (8:1) and *desirable* (9:1).

4. Do you consider an elementary course in general biology to be superior, from the standpoint of the biological sciences in general, to two virtually independent but consecutively arranged courses: one in elementary botany, given by botanists; the other in elementary zoology, given by zoologists? Do you consider it inferior?

Replies.—Botanists: Class A, *biology inferior* (50:3); Class B, *biology inferior* (7:4). Zoologists: Class A, *biology inferior* (17:8); Class B, *biology superior* (8:0).

5. Assuming that an elementary course in general biology is to be given, should it be taught by zoologists alone? by botanists alone? or by both zoologists and botanists?

Replies.—Botanists (*a*) *by both botanists and zoologists,* 58; (*b*) *by one teacher, by a biologist, or by one trained in both botany and zoology,* 12; (*c*) *immaterial—depends on*

[2] In presenting these figures, no account has been taken of the subject-matter or the mode of presentation of these courses. It is important to note, however, that in 2 of the 6 institutions of Class A where general biology is still given, the course is virtually half botany, half zoology, being taught conjointly by botanists and zoologists. The same holds true in several of the 14 institutions of class B which are cited as giving general biology. In 3 of the 6 institutions in Class A, referred to above, general biology is placed in a class by itself, not being required as a prerequisite to courses in botany or zoology.

teacher, 3. Zoologists: (*a*), 25; (*b*), 12; (*c*), 6; (*d*), *by a zoologist*, 2.

Summarizing the opinions above stated, it is evident:

1. That the majority of botanists (49:24) are opposed to a course in general biology, while the majority of the zoologists (31:14) favor such a course.

2. That, if given, the majority of botanists (44:19) would treat it as an independent entity, while the majority of zoologists (20:15) would make it prerequisite to courses in botany and zoology.

3. That in the opinion of the majority of botanists a course in general biology does not constitute a desirable prerequisite (54:18) to courses in botany and zoology, and should not be made an obligatory prerequisite (59:13); while in the opinion of the majority of zoologists it is a desirable prerequisite (23:20), although it should not be made obligatory (22:18).

4. That the great majority of botanists (57:7) regard a course in general biology as inferior to two consecutively arranged but virtually independent courses, elementary botany and elementary zoology, while the zoologists are about evenly divided (inferior, 17:16) on this question.

5. That in the opinion of the majority both of botanists (58) and zoologists (25) a course in general biology should be taught by both botanists and zoologists rather than by either one or the other; while in the opinion of a minority (15 botanists, 20 zoologists) it should be given by one teacher.

Theoretically, a course in general biology such as the one here prescribed may seem desirable; practically it is not. This in effect is the opinion of many botanists and zoologists, both among those who voted in its favor and among those who voted against it. The truth of this assertion is substantiated by the relatively large number of institutions which in times past have organized such a course, only to abandon it. Whatever may be said in its favor, the fact remains that in the long run the general biology course has not proved satisfactory in at least the majority of those institutions having distinct departments of botany and zoology. On the whole, it appears that the advantages gained, if there are any, by attempting to dove-tail botanical and zoological material into one harmonious whole are more than outweighed by the disadvantages. The nature and seriousness of these disadvantages, as expressed by various college and university teachers, is indicated in the paragraphs which follow.

1. *An elementary course in general biology is altogether too dependent for its success on the personnel of its teaching staff.*

It is quite as important how a thing is taught the student as what is taught him. In the hands of a master, general biology, or any other subject, can not fail to be a source of profit and inspiration. But the type of course that leans too heavily for support on the personality of the teacher is destined to fall, sooner or later. Huxley's own course in elementary biology virtually died with him, for when he ended his teaching career at the Royal College of Science it was divided into two practically independent courses, a botanist being appointed to do the botanical teaching and a zoologist the zoological—an arrangement that has continued to the present day.

It is doubtless true that there are some zoologists who are capable of giving a better course in botany than are many botanists (and vice versa). But how many zoologists or botanists of this sort are there in charge of courses in general biology? Unquestionably there are occasional teachers of biology in our higher institutions of learning who are well equipped both on the botanical and the zoological side of biology, and who are impartially interested in both phases of life—men with a broad vision over both fields and competent both to organize and to conduct a course in general biology: in other words, true biologists. But in these days of specialization men of this type are so rare as to be almost extinct. The average biologist, so styled, is not a biologist at all in the true sense of the word. He reads the *Journal of Experimental Zoology* or the *Botanical Gazette*, but rarely both. He is a member of the Society of American Zoologists or of

the Botanical Society of America, but never of both. His research is in animal biology (or zoology) or in plant biology (or botany), one or the other. In short, he is either a zoologist or a botanist. To be sure, certain groups of botanists and zoologists find a common meeting ground in the American Society of Naturalists or in the Ecological Society of America. The geneticist, whether working with plants or animals, reads *Genetics* and the *American Naturalist;* the ecologist reads the *Journal of Ecology.* But the mutual interests which bind together various groups of zoologists and botanists are in very special fields, such as genetics, evolution, cytology and ecology. The fact remains that, while there are plenty of ardent zoologists and ardent botanists, there are few, if any, ardent biologists.

In charge of either zoologists or botanists how can a course in general biology help becoming one-sided? One phase is almost sure to be emphasized at the expense of the other, and the student can not avoid getting a distorted view of biology. Where taught by a zoologist general biology too often becomes zoology with a mere sprinkling of plants, and possibly vice versa. Even if he means to give fair and impartial treatment to both phases of biology, it is indeed a rare enthusiast who can avoid instilling his students with the greater importance of his own particular field of interests.

But there is still another objection to a general biology course being given either by a zoologist or by a botanist. There are altogether too many good zoologists, for example, whose knowledge of biology outside their own field is extremely limited. Only too often their familiarity with plants is little more than skin-deep. They may have sufficient information to enable them to work into a general biology course whatever of botany they deem essential, but beyond the covers of the text-book they have no real knowledge of the subject. Their thin veneer of botanical wisdom may well pass muster in a high school, but it does not take the more mature college student long to penetrate beneath the surface. It is an experience altogether too common that a student coming into botany from a course in general biology is so woefully lacking in his comprehension of plant life that it is necessary for him to repeat all over again the botanical studies he has already made. And what is more, such impressions as he has gained, quite as often as not, are inaccurate if not absolutely incorrect. The old adage is a good one: "Let the cobbler stick to his last."

If a course in general biology is to be given at all it should be conducted either by genuine biologists or else conjointly by both zoologists and botanists. A dual teaching force, part zoologists and part botanists, apparently has proved successful at some institutions where general biology is taught, but more often this arrangement seems to have proved a failure. A course given by two heads is liable to lack the necessary unity. Different points of view, interdepartmental jealousy, human nature: all these interfere with complete harmony. Such a course will naturally tend to resolve itself into two more or less distinct portions. Why not recognize this danger and, instead of attempting to splice together the subject matter of the two fields of biology, give two courses from the outset?

2. *Biology is a hybrid course.*

An elementary course in general biology interweaves a study of plants and animals in an impossible attempt to show to beginning students that the two sets of forms illustrate the same principles. The fact is that while botany and zoology are both biological subjects, botany is the study of one phase of life and the structures which it has built up, just as zoology is the study of another phase of life and the analogous but not homologous structures which it has built up. The elementary student needs to have emphasized, in studying these two sciences, the dissimilarities rather than the similarities. Each line of study has its most important problems of relationship, evolution and physiology connected in its series, and these can not be brought out as clearly nor with as much emphasis when the two are mixed up together. There may be some advantages, if one is con-

sidering only the lower organisms, in studying plants and animals together, but when it comes to the higher forms there is a distinct disadvantage in attempting to mix the two in one elementary course. For example, "what advantage is there in studying a fern by the side of a lobster, or an earthworm by the side of a moss, or a monkey with an oak tree—unless, indeed, you are going to consider problems of the athletics of the monkey in relation to the tree?"

There is no more justification for combining botany and zoology into one elementary course than there is for giving a combined elementary course in physics and chemistry. We may equally well have a general Greek-and-Latin course for elementary students which will introduce them at once to philology. The general biology course belongs in the same class with the general science course, which is universally conceded to be of too superficial value to merit a place in the curriculum of any institution above the grade of high school. It is but a step removed from the natural science course which figured in so many college curricula of a past generation.

3. *An elementary course in general biology lays too much stress on abstract principles and too little on concrete facts.*

"Sound and thorough knowledge is only to be obtained in the laboratory," writes Huxley. A firm basis of fundamental facts is absolutely prerequisite to a clear comprehension of underlying principles. This is just as true in the biological sciences as it is in chemistry or physics or mathematics. The student must actually work with plants as plants and with animals as animals and become thoroughly familiar with their structure, physiology and reproduction before he can appreciate broad generalizations. Make general biology, if anything, an advanced course in evolution or biological principles, to follow specific courses in botany and zoology: a summation, rather than an introduction. Teach the student to generalize on many particulars, not on a few. Train him first to be precise in his methods and accurate in his conclusions. Develop his powers of observation. In an elementary course in general biology the student is apt to become so enamoured of the grand general underlying principles that he has little use for details, with the result that he becomes loose and slipshod in his methods and utterly incapable of accurate, independent work. Let the student learn to be analytic before he attempts synthesis.

4. *An elementary course in general biology, as ordinarily presented, tends to give the student the impression that he has something he does not possess.*

Dealing in one short course, as too often it pretends to do, with all the large problems of life, general biology commonly aims to accomplish the impossible. Covering, as it seems to, the whole realm both of plant and animal life—morphology and physiology, evolution, cytology and genetics, not to mention bacteriology and hygiene—it leads the student to think he has a comprehensive knowledge of it all, when in fact he has only a superficial smattering of anything. Touching as it must only the high lights, it tends to muddle the student's mind and to leave him with little more than an uncoordinated jumble of facts.

5. *For students who plan to take further work in either botany or zoology, an introductory course in general biology is especially disadvantageous.*

It is primarily essential that such students, at the outset, should lay a firm foundation of fact upon which to base subsequent studies; that they should develop their powers of observation; that they should learn to work and think independently, to draw careful and accurate conclusions. It is disadvantageous that the introductory course should encroach upon the work of more advanced courses, for "when the student begins these more advanced courses he loses the advantage of entering entirely novel fields." And it is further disadvantageous, as so commonly is the case, that a student going on in botany should receive his introductory training in this phase of biology at the hands of a zoologist (and vice versa).

6. *In an institution having two distinct departments, a department of botany and a department of zoology, it is disadvantageous that*

one of these departments should give a course called general biology.

The disadvantages accruing from such an arrangement are patent to everyone and need not be detailed. The botanical department should give an elementary course in botany and the zoological department a similar course in zoology. If the zoologist wishes to use plant material to illustrate certain features (and vice versa), let him do so, but do not on that account let the course be labeled by the misnomer "general biology."

The general biology course owes its perpetuation, as it did its inception, primarily to the zoologists. The fact can not be overlooked that in institutions having distinct departments of botany and zoology, but where general biology is still taught, this course is in charge of zoologists, although in two of these institutions it is given in part by botanists. Further, in institutions having but one department, the department of biology, and where such a course is given, the department, as a rule, is predominantly zoological. And finally, it is more than a coincidence that nearly all of the many text-books in general biology now on the market, like their progenitor, have been written by zoologists (or else by high-school teachers). The Huxley and Martin text-book, to quote a former leader among American botanical teachers "was very useful, but its influence on botany was distinctly vicious. Wherever the book went, it put botany back as a mere 'Anhang' to zoology." It is books of this description that have led a well-known eastern botanist to define biology as "botany taught by a zoologist."

What, then, should be the nature of elementary courses in the biological sciences?

1. There should be two distinct courses: elementary botany or plant biology, taught by a botanist, and elementary zoology or animal biology, taught by a zoologist.

2. Each of these courses (or the two taken together; see below) should aim to achieve a two-fold end: it should serve as an introduction to more advanced courses, and it should also satisfy the requirements of the student for whom it will constitute the only biological course.

3. It is felt by many botanists and zoologists that special courses in the biological sciences should perhaps be arranged for the benefit of students who wish to take but one course in this field. Thus, nearly half of the botanists and zoologists who voted *in favor* of the general biology course, advocated that it be given, *not as a prerequisite* to advanced courses in botany and zoology, *but as an entity in itself*. Where the resources of an institution permit, "culture courses" in botany or zoology, or in botany and zoology, might well be offered in addition to the introductory courses in these subjects. Such courses would not be open to certain of the objections which have been urged against the general biology course. Indeed, while they might be planned along quite different lines from purely introductory courses, there is no reason why they should lay themselves open to any criticism whatever. There is always the danger, however, of attempting to be too comprehensive. Though perhaps to a lesser degree than when taken as a professional study, the value to the student of botany or zoology as a cultural study lies quite as much in methods acquired and in facts observed as it does in the information which is received. First and foremost the student should be taught to be careful in his technique, to be precise in his observations, to be thorough in his attention to details, to be keen in finding out things for himself, to be accurate in his conclusions. The content and scope of such courses must be determined by the individual teachers or departments concerned and the writer ventures no recommendations on this point.

In 50 of the 66 colleges and universities investigated by the questionnaire the elementary courses in botany and zoology are distinct from one another (this number includes 4 which in addition have a course in general biology). With reference to the arrangement of these courses, however, there are two groups. In one group, comprising 23 institutions, each course, elementary botany and elementary zoology, extends over a half year and the two, though vir-

tually distinct from one another, are so arranged that it is possible for the student to take them consecutively and practically as one continuous course within a year. In the other group, comprising 30 institutions, both the elementary botany course and the elementary zoology course extend through the entire year. In three institutions both of these schemes are in effect. While it is not the intention of the writer to express his personal views regarding the relative merits of these two schemes, the expressions of opinion elicited from botanists and zoologists at the various institutions where the respective plans are actually in operation, if not conclusive, are certainly suggestive.

In institutions where both elementary botany and elementary zoology are half-year courses, consecutively arranged, so that the student can take both within a year and practically as one continuous course, essentially the only objections offered are that in some places it is possible for the student to take one course, but not the other. Assuming, however, that a year's work is required (as of course it would be by either alternative arrangement) the consensus of opinion is as follows. This arrangement produces results satisfactory to both botanists and zoologists (botanists, 25:1; zoologists, 9:0). It possesses no serious disadvantages (botanists, 25:2; zoologists, 10:0). It is a satisfactory arrangement, both for the student who contemplates further work along biological lines (botanists, 25:1; zoologists, 10:0) and for the student who plans to go no further (botanists, 20:4; zoologists, 7.1).

In institutions where both elementary botany and elementary zoology are full-year courses, wholly independent of one another, the consensus of opinion is as follows. It produces results satisfactory to both botanists and zoologists (botanists, 27:3; zoologists, 16:6). According to the majority of botanists (20:8) it has no serious disadvantages; but the zoologists, by a small majority (12:9), are of the opposite opinion. According to the majority of both botanists (21:4) and zoologists (13:5) it is a satisfactory arrangement for students who plan further work in the biological sciences; but according to the majority of the both botanists (16:13) and zoologists (12:7) it does not constitute a satisfactory arrangement for the student who contemplates no further work along biological lines.

The arguments in favor of consecutive half-year courses in botany and zoology are self-evident. This arrangement gives students who will go no further some knowledge of the facts, principles and problems in both fields of biology, and at the same time it constitutes a satisfactory introduction to further work in either botany or zoology. Whether and to what extent it should be attempted to coordinate the two is a question concerning which opinions seem to vary, and in all probability this should be determined in large measure by local conditions. There is little question, however, that if properly coordinated these two courses will accomplish everything which can reasonably be expected of the general biology course, but with the objectionable features of that course eliminated. Advocates of the full-year elementary botany and zoology courses are of the opinion that a half year is not sufficient time for an elementary course in either botany or zoology; that botany and zoology, like chemistry and physics, should be treated as separate sciences; and that the student in either course obtains an introduction to the fundamental biological principles, methods, and facts. The chief objection to this scheme is obvious. The student who is going on with botany or zoology loses the advantage of an early introduction to both sciences, while the student who takes only one year of biological science loses entirely either one phase or the other.

But the object of this paper is *not* to recommend any specific arrangement of elementary courses in botany and zoology. It is *not* to settle questions as to the subject-matter of elementary courses in either subject. The primary purpose of this article is to urge, in the interest of the students, teachers, and departments concerned, and in the interest of the biological sciences themselves, that, in elementary courses, botany should be taught *as botany* and zoology *as zoology*. The general biol-

ogy course is "simply a survival of an early stage in the pedagogy of the subject and has no place in a modern educational scheme."

GEORGE E. NICHOLS

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STATE ACADEMIES OF SCIENCE

CERTAIN groups of people interested in the development and application of the sciences in many of the states of the union have established academies of sciences. Some of the academies have developed into institutions exerting considerable influence at the present time, others have flourished for a period and then gradually have declined in their force until now it has become a question whether they should disband or should reorganize. Others have struggled to develop interest for a considerable period in their communities but finally have ceased to exist.

During the past year data have been collected and an attempt has been made to determine the general status and activities of all the state academies in order that each one may know its own relative standing in regard to resources and activities.

CLASSIFICATION OF MEMBERS OF STATE ACADEMIES

State Academies	Botany	Chemistry	Geology	Mathematics	Medicine	Physics	Zoology	Unclassified	Total
Colorado.....		20	75	11	5	15		20	146
Connecticut ..	4	4	12	2	12	4	7	128	172
Illinois.....	63	45	28	9	29	29	56	55	314
Indiana	51	24	16	10	22	23	55	30	231
Iowa	60	30	40	18	12	30	60	100	350
Kansas.....	20	30	10	10	12	12	10	79	173
Kentucky	13	24	12	9	4	13	12	9	96
Michigan	55	0	30	0	21	0	45	33	208
Nebraska	13	8	5	4	9	5	10	19	73
New Mexico..	3	3	3	5	0	3	2	6	25
North Carolina	13	13	4	4	1	6	15	24	80
Ohio	66	6	40	4	16	29	79	18	258
Tennessee....	5	14	6	4	0	8	1	37	75
Utah	11	6	4	1	5	10	14	41	92
Total.....	377	227	285	91	148	187	366	599	2,293
Per cent....	16.4	9.8	12.4	3.9	6.4	8.1	15.9	26.1	

Questionnaires were sent to all state academies of science and the returned information has been tabulated. The classification of members was arbitrarily limited to eight groups and only aims to indicate the general field of interest of the members. Several academies did not furnish a classified list of their members. Each secretary was asked to state whether the interest in the affairs of the academy by its members was "lively" or "apathetic." Such statements, in some instances, should be taken with reservations because of the personal element or the period of the year in which it was given. Much of the data is self explanatory and needs no comments.

Among the various conclusions that may be drawn from the data the one that is especially evident is that only a small percentage of the scientific people of the country are members of the various state academies. The reason for this lack of interest and activity is explained by one secretary as being due to the fact "that the day has gone by when men interested in widely different special lines of research or activity can profitably meet for the common discussion of their interests."

At the present time nearly all specialists belong to a national society composed of members all of which are interested in the same special science. Such people derive more benefit from this society than they would from a local academy. In order to meet this situation many of the academies have attempted sectional meetings in which those interested in any particular science might convene. This has been successful in a few large academies but in the smaller ones it has failed.

Whatever may be said in regard to the weaknesses of the academies two points should be remembered. First, the academies provide at their general meetings opportunities for considerable social intercourse between people from different parts of their respective states. This social factor has a tendency to promote good fellowship between the various institutions of the state and also to encourage research in the smaller colleges and normal schools. Second, many of the academies are able from funds provided from

GENERAL DATA OF STATE ACADEMIES

Academies of Sciences.	Members	Annual Dues	Annual State Appropriation	Salary of Officers	Annual Pages of Publications	Interest
California	300±	$ 6.00	No data given			
Colorado	142	10.00	None	$600	110±	"Apathetic during war, but now interest is reviving."
Connecticut	172	5.00	From private funds, $1,530	None	450	"Lively interest in publications, but a decided lack of interest in the meetings."
Florida	88	1.00	None	None	None	"Dead"
Illinois	314	1.00	$1,000	None	345±	"More lively than apathetic"
Indiana	231	1.00	$700	None	475	"Good and getting better"
Iowa	350	1.00	Printing	None	550–600	"Lively"
Kansas	173	1.00	$1,300	$1,000	400	"Rather apathetic"
Kentucky	96	1.00	None	None	None	"Fairly lively"
Michigan	208	1.00	Printing	$75	300–400	"Interest reviving"
Nebraska	73	1.00	$150	None	75	"Lively interest at the annual meeting, but apathetic the remainder of year"
New Mexico	25	.50	None	None	None	
New York	624	10.00	From private funds, $2,538	$900	300–500	"Active"
North Carolina	80	1.00	None	None	125–150	"Very lively"
Ohio	258	1.50	From private funds, $250	None		Fair
Oregon						"Long time dead"
Tennessee	75	2.00	None	None	50±	"60 per cent. alive"
Texas	No data given excepting					"Apathetic"
Utah	92	1.00	None	None	244 (1908–1917)	"Rather apathetic"
Washington, D. C.	518	5.00	From private funds, $750	None	800	"Active"
Wisconsin	350	1.00	$1.500	$200	500	"About 50/50"
Wyoming						"Dead"
Philadelphia Acad. Nat. Sci.	458	10.00	From private funds, $36,000	$19.000	650	"Up to standard"
St. Louis	210	6.00	From private funds, $650	$900	200–300	"Majority apathetic"

state or private sources to publish articles of considerable scientific value which due to their extreme specialization, local or very general nature, would not be accepted by the current journals. If the academies have outlived their general usefulness they can still remain very influential in existing solely as publication centers for special articles.

The American Association for the Advancement of Science has recently proposed a plan in which it has invited the academies to affiliate with it. This is not only a very gracious act but one that may stimulate the academies to further and more important activities.

David D. Whitney,
President of the Nebraska Academy of Sciences, May 1918, to May, 1919

October 15, 1919

RESULTS OF THE TOTAL SOLAR ECLIPSE OF MAY 29 AND THE RELATIVITY THEORY[1]

The results obtained at the total solar eclipse of May 29 last were reported at a joint meeting of the Royal and the Royal Astronomical Societies, held on November 6. The stations occupied were Sobral, in North Brazil, and Principe Island. Two cameras were employed at Sobral, the 13-in. objective of the Greenwich astrographic equatorial, and a 4-in. lens, of 19-ft. focus, lent, together with an 8-in. cœlostat, by the Royal Irish Academy. It was realized before the expedition started that the cœlostat was scarcely suitable for observations of such extreme precision as were required to detect and measure the

[1] From *Nature*.

small shift in the places of the stars that might be produced by the sun's attraction. War conditions, however, made it impossible to construct a suitable equatorial mounting, though it is hoped that this may be done before the eclipse of 1922.

The results, to some extent, but, fortunately, not entirely, justified these apprehensions. The eclipse plates taken with the 13-in. (stopped down to 8 in.) are out of focus. Since the focus was good on photographs taken at night a few hours earlier, and also on the check plates taken before sunrise in July, the explanation appears to be a change of figure of the cœlostat mirror, due to the heat of the sun. These plates were compared with the July check plates by using a duplex micrometer. They show an undoubted gravitational shift, the amount at the sun's limb being 0.93″ or 0.99″, according to two different methods of treatment. The probable error, as estimated by the individual discordances, is about 0.3″, but there is reason to suspect systematic error, owing to the very different character of the star-images on the eclipse and check plates. This instrument supports the Newtonian shift, the amount of which is 0.87″ at the limb. There is one mode of treatment by which the result comes out in better accord with those of the other instruments. Making the assumption that the bad focus did not alter the scale, and deducing this from the July plates, the value of the shift becomes 1.52″.

The results with the 4-in. lens are much more satisfactory. The star-images are well defined, and their character is the same on the eclipse and check plates. As the duplex micrometer would not fit these plates, a key-plate, on which the film was placed away from the lens, was taken in July, and all the plates in turn were placed in contact with this plate and compared with it. The resulting shift at the limb is 1.98″, with a probable error of 0.12″. The values from the separate stars are in good accord, and they support the fact of the shift varying inversely as the distance from the sun's center; they are thus unfavorable to its being due to refraction, as was suggested by Professor Newall at the meeting. Moreover, Professor Lindemann pointed out that the comets of 1880 and 1882 had traversed this region without giving the slightest evidence of having encountered resistance; as their speed was about 300 miles per second, a vivid idea is given of the extreme tenuity of any medium that they encountered.

The Principe expedition was less fortunate in the matter of weather, but a few plates showed five stars. Since no check plates of the eclipse field could be taken there, another field near Arcturus was photographed, and both it and the eclipse plates were compared with plates of the same fields taken at Oxford with the same object-glass. It was, moreover, necessary to assume that the scale of the eclipse plates was the same as that of the check plate. This is justified by the fact that the diurnal variation of temperature in Principe is only some 4° F., and that there had been no bright sunshine on the mirror before totality. The measures indicate a shift at the limb of 1.60″, with a probable error of 0.3″.

It will be seen that the mean of this result and that with the 4-in. at Sobral agrees very closely with Einstein's predicted value 1.75″. It was generally acknowledged at the meeting that this agreement, combined with the explanation of the motion of the perihelion of Mercury, went far to establish his theory as an objective reality. Sir J. J. Thomson, who presided, spoke of the verification as epoch-making; he suggested that it would probably have a bearing on electrical theory, but he regretted the very complicated form in which Einstein expressed his theory, and hoped that it might be possible to put it into a form in which it would be more generally comprehensible and useful.

Dr. Silberstein laid great stress on the failure to confirm Einstein's third prediction, that of the displacement of lines in the sun's spectrum towards the red, to the amount of 1/20 Angström unit; this had not been verified, in spite of the careful search made by Dr. St. John and Mr. Evershed. As the probable error of the measures was much less than the quantity predicted, he looked on this

result as final; some people had suggested that the shift might be veiled by a systematic outward movement of the photosphere, but as Dr. St. John made measures both at the sun's center and limbs, that suggestion was not tenable. Professor Eddington admitted that the failure threw doubt on the validity of some of the steps which led Einstein to his gravitational result; but he contended that the two other successes indicated that the result was right, even if reached by a wrong method.

There was some discussion on Professor Lindemann's method of photographing stars in daylight by the use of red screens. However, the eclipse method seems more trustworthy, and the Astronomer Royal expressed the hope that the eclipse of 1922 might be observed with equatorials. The star-field is not so rich as in the late eclipse, but with longer exposure much fainter stars could be recorded. The eclipse-track crosses the Maldive Islands and Australia, and is therefore fairly accessible.

A. C. D. Crommelin

SCIENTIFIC EVENTS

INVESTIGATIONS ON INFLUENZA

The Metropolitan Life Insurance Company has provided resources to carry on investigations into the cause, mode of transmission and treatment of influenza and its complications.

A commission has been appointed consisting of Dr. G. W. McCoy, director of the hygienic laboratory, U. S. Public Health Service; Dr. W. H. Park, director of the research laboratory, New York City Department of Health; Dr. Lee K. Frankel, third vice-president of the Metropolitan Life Insurance Company; Dr. A. S. Knight, medical director of the Metropolitan Life Insurance Company; Dr. M. J. Rosenau, chairman, professor of preventive medicine and hygiene, Harvard Medical School. Later, Professor E. O. Jordan, of the University of Chicago, and Dr. W. H. Frost, of the U. S. Public Health Service, were invited to join in the work.

Work has already been begun in Washington, New York, Boston and Chicago and may be extended to other places as occasion arises. In this way correlation and cooperation are effected. The object of the commission is primarily to study the cause, mode of spread and treatment of influenza and its complications. Studies are now being made upon the prophylactic value of vaccines against influenza, common colds and pneumonia, properly controlled. Laboratory researches are being conducted to determine the cause of these infections, and a special study is being made of the bacterial flora of the upper respiratory tract in health and disease. Special consideration is being given to the possibility of a filterable virus being the cause of any of these infections. Cooperation and suggestions have been invited from health officers and others interested.

PROBLEMS OF FOOD AND NUTRITION

The National Research Council has formed a special committee on Food and Nutrition Problems, composed of a group of the most eminent physiological chemists and nutrition experts of the country. The members are: Carl Alsberg, chief, bureau of chemistry, Department of Agriculture; H. P. Armsby, director of the institute of animal nutrition, Pennsylvania State College; Isabel Bevier, director of department of home economics, University of Illinois; E. B. Forbes, chief, department of nutrition, Ohio Agricultural Experiment Station; W. H. Jordan, director, N. Y. Agricultural Experiment Station; Graham Lusk, professor of physiology, Cornell University Medical College; C. F. Langworthy, chief of office of home economics, Department of Agriculture; E. V. McCollum, professor of biochemistry, School of Public Health and Hygiene, Johns Hopkins University; L. B Mendel, professor of physiological chemistry, Yale University; J. R. Murlin, professor of physiology and director of the department of vital economics, University of Rochester; R. A. Pearson, president of the Iowa State Agricultural College; H. C. Sherman, professor of food chemistry, Columbia University; A. E. Taylor, Rush professor

of physiological chemistry, University of Pennsylvania; and A. F. Woods, botanist, president of Maryland State College of Agriculture.

This committee will devote its attention and activities to the solution of important problems connected with the nutritional values and most effective grouping and preparation of foods, both for human and animal use. Special attention will be given to national food conditions and to comprehensive problems involving the coordinated services of numerous investigators and laboratories. The committee, with the support of the council, is arranging to obtain funds for the support of its researches, and will get under way, just as soon as possible, certain specific investigations already formulated by individual committee members and sub-committees. These include studies of the comparative food values of meat and milk and of the conditions of production of these foods in the United States, together with the whole problem of animal nutrition; the food conditions in hospitals, asylums and similar institutions; the nutritional standards of infancy and adolescence; the formation of a national institute of nutrition; and other problems of similarly large and nationally important character.

THE ELIZABETH THOMPSON SCIENCE FUND

AT a meeting of the trustees of the Elizabeth Thompson Science Fund, held on Thursday, November 20, the following grants were voted: two hundred and fifty dollars to Professor Duncan S. Johnson, of Johns Hopkins University, for studies on the Development, Persistence and Growth of the Cactaceæ and Certain Myrtaceæ; two hundred dollars to Professor Antonio Pensa, of the University of Sassari, Italy, for investigations on the Cytology of Vegetable Cells; and three hundred dollars to Professor Lawrence J. Henderson, of Harvard University, for a research on the Heats of Reaction of Oxygen and Carbon Dioxide with Hæmoglobin solutions.

The Elizabeth Thompson Science Fund has been serviceable for many years in giving aid, by small grants, to research which otherwise might not be readily undertaken. The grants are made only for scientific investigations and must be applied to actual expenses of the research, *i. e.*, they are not made to support an investigator or to meet the ordinary expenses of publication. The trustees give preference to researches involving international cooperation. The grants are not made for researches of narrow or merely local interest, nor are they available for equipment of private laboratories or for purchase of apparatus ordinarily to be found in scientific institutions. Applications for grants from this fund should be made before January 15, 1920, to Professor W. B. Cannon, secretary of the trustees of the fund, Harvard Medical School, Boston, Mass.

ENDOWMENT OF THE MEDICAL SCHOOL OF VANDERBILT UNIVERSITY

ANNOUNCEMENT is made that the General Education Board of New York, has appropriated the sum of $4,000,000 for the purpose of enabling the Vanderbilt University to effect an entire reorganization of its medical school, in accordance with the most exacting demands of modern medical education.

The faculty of the medical school has for some years been urging upon the trustees of the university the necessity of radical and thoroughgoing organization, and it is promised its hearty and unconditional cooperation in the establishing of a new school of medicine in Nashville, as an integral department of Vanderbilt University.

Detailed plans for the new school have not as yet been developed, but they will unquestionably involve the completion of the present Galloway Memorial Hospital, with enlarged faculties for public patients, the erection in the near future of an additional hospital unit, the organization of a modern laboratory building, and the appointment of an increased number of professors, giving their entire time to the school and hospital, in both laboratory and clinical branches. Thus, not only will the endowment of the medical school be very greatly increased, but it will start its career with a modern and up-to-date plant—laboratory as well as hospital.

It is stated that this contribution by the

general education board comes from the general funds of the board, and not out of Mr. Rockefeller's recent donation of $20,000,000 for the promotion of medical education in the United States. The gift was in fact determined on before Mr. Rockefeller's recent gift was known.

THE ST. LOUIS MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The opening general session of the association will be held on Monday night, December 29, at 8 P.M. in the Assembly Room of the Soldan High School. Dr. Simon Flexner, director of the laboratories of the Rockefeller Institute for Medical Research, will preside. General announcements concerning the meeting will be made, the revised constitution of the association will be presented for vote and the retiring president, Professor John Merle Coulter, of the University of Chicago, will deliver his address on "The Evolution of Botanical Science." The meeting will be followed by an informal reception to members of the American Association and of affiliated societies.

Registration headquarters, permanent and assistant secretaries' offices, meetings of the council, and all sessions of the association and the affiliated societies will be held in the Soldan High School. A directory will be conveniently placed in the main lobby and each room will be placarded indicating the various sessions.

There will be an information booth in Union station, where directions will be given for reaching hotels and meeting place. An attendant will be at booth at the time of arrival of all important trains on Sunday, Monday and Tuesday, December 28, 29 and 30. Hotel Statler will be the general headquarters. The local executive committee consists of George T. Moore, Alexander S. Langsdorf, Augustus G. Pohlman, John W. Withers and John M. Wulfing.

SCIENTIFIC NOTES AND NEWS

The Royal Society has awarded its medals as follows: Royal medals to Professor J. B. Farmer for his work on plant and animal cytology, and to Mr. J. H. Jeans for his researches in applied mathematics; the Copley medal to Professor W. M. Bayliss for his contributions to general physiology and to biophysics; the Davy medal to Professor P. F. Frankland for his work in chemistry, especially that on optical activity and on fermentation; the Sylvester medal to Major P. A. MacMahon for his researches in pure mathematics, especially in connection with the partition of numbers and analysis; and the Hughes medal to Dr. C. Chree for his researches on terrestrial magnetism.

Dr. Charles D. Walcott, secretary of the Smithsonian Institution, has been elected an associate member of the Paris Academy of Sciences.

Honorary membership diplomas and medals have been conferred by the Antwerp Zoological Society upon Professor Henry F. Osborn, president of the New York Zoological Society, and Dr. William T. Hornaday, director of the New York Zoological Garden, in testimony of its gratitude for a gift of animals sent to the Antwerp Garden.

Dr. Raymond Pearl, professor of biometry and vital statistics in the School of Hygiene and Public Health of the Johns Hopkins University has been appointed statistician to the Johns Hopkins Hospital.

Dr. Walter Van Dyke Bingham, director of the division of applied psychology of the Carnegie Institute of Technology, has been elected first chairman of the division of anthropology and psychology of the National Council of Research, and has been granted half-time leave until July 1, 1920.

Dr. Paul G. Wooley, professor of pathology in the college of medicine of the University of Cincinnati, has resigned.

Lieutenant Colonel Coert DuBois, district forester at San Francisco, California, has resigned from the U. S. Forest Service and entered the Consular Service. Colonel DuBois has been a member of the Forest Service since 1900.

Ellsworth Y. Dougherty has been appointed mining geologist in southern Oregon

for the Oregon Bureau of Mines and Geology.

DR. A. R. DAVIS, assistant professor of plant pathology and physiology, University of Nebraska, has accepted a position in the division of soil chemistry and bacteriology, University of California. Captain Davis has recently returned from France where he saw service with the heavy artillery.

IT has been stated in SCIENCE that G. B. Richardson has been placed in direct charge of the oil and gas section of the U. S. Geological Survey. Mr. Richardson has been placed in charge of the oil and gas section of the Division of Mineral Resources of the U. S. Geological Survey. Mr. David White remains at the head of the oil and gas section of the Division of Geology.

THE Observatory of Leiden is being enlarged and reorganized according to plans submitted by the new director, Professor W. de Sitter. It will henceforth consist of three departments—Fundamental Astronomy, Astrophysics and Theoretical Astronomy—with subdirectors in charge of the first two. Professor E. Hertzsprung has been appointed sub-director of the Astrophysical Department.

PROFESSOR ROBERT K. NABOURS, of the zoology department, Kansas State Agricultural College, has been given a year's leave of absence to make a third trip to Turkestan in the interest of the Karakul fur industry. During his absence Dr. James E. Ackert will be acting head of the department.

DR. EDWARD C. SCHNEIDER, formerly major in the Sanitary Corps, and now head professor of biology at Wesleyan University, Middletown, Conn., has been asked to continue as physiologist in charge of the physiological department of the medical research laboratory in the Air Service of the Army, at Hazelhurst Field, Mineola, L. I. He is giving two days of each week to this work.

DR. LOUIS A. BAUER gave an illustrated lecture on the "Solar Eclipse of May 29, 1919, and the Einstein Effect," before the Royal Astronomical Society of Canada at the University of Toronto, on December 2, and at the College of the City of New York on December 4, at noon. The lantern slides showed views of the solar eclipse and of various expeditions of the Department of Terrestrial Magnetism and of the astronomical expeditions sent out by the Smithsonian Expedition, Great Britain and Brazil, covering the belt of totality from Bolivia to the French Congo.

A HARVEY SOCIETY lecture will be given by Dr. E. C. Kendall, of the Mayo clinic, on "The chemistry of the thyroid secretion" at the New York Academy of Medicine on the evening of December 13.

DR. G. M. STRATTON, professor of psychology in the University of California, has accepted an invitation to deliver the Nathaniel W. Taylor Lectures at the Yale School of Religion, beginning April 12, 1920.

THE Lane medical lectures to be given by Dr. Alonzo E. Taylor, professor of physiological chemistry in the University of Pennsylvania, will have at their subject "The Feeding of the Nations at War." The titles of the lectures are:

December 8, "The problem of feeding a nation."

December 9, "The feeding of the United Kingdom."

December 10, "The feeding of France and Italy."

December 11, "The feeding of the enemy states."

December 12, "The food problem of Europe after the war."

THE executive committee of the Federation of Biological Societies, which includes the American Physiological Society, has called the annual meeting at Toronto, Canada, December 29, 30 and 31, 1919. The meeting is at the invitation of the University of Toronto. This is the thirty-second annual meeting of the American Physiological Society and it is hoped that this first post-war gathering may be made an epoch meeting. The meeting places of all the societies and the general offices of the federation will be in the medical building of the University of Toronto. Accommodations for approximately 200 members can be obtained by the local committee in the residences of the university and its colleges.

The Division of Industrial Research of the National Research Council is arranging for the formation of a cooperative association to plan and support fundamental researches in alloys. Although much valuable work has been done in this field by scattered investigators there is no doubt that a well-planned and coordinated effort by a cooperative association working under the general guidance of the National Research Council and composed of specialists representing both the manufacturers and the more extensive users of alloys can produce additional results of great importance. The success of other industries which have supported research on a cooperative plan, such as has been done by the National Canners' Association and the Malleable Iron Manufacturers, is evidence of this. It is planned to create a special scientific staff composed of a director and assistant director of research and a group of scientific investigators and technical experts who shall give their whole time to the work. To finance the organization each member of the cooperative association will pay $1,000 a year, and all contributing members, who may be either alloy manufacturing or using individuals, firms or companies are to benefit alike by the results of the researches.

UNIVERSITY AND EDUCATIONAL NEWS

McCoy Hall and others of the old buildings of the Johns Hopkins University were destroyed by fire on the night of November 27. The loss is covered by insurance, but valuable libraries and records of the school of hygiene and public health, which occupied the second floor of McCoy Hall, were destroyed with irreparable loss.

The main buildings of the University of Montreal, known as Laval University, containing the medical department, were destroyed by fire on November 22. The loss is estimated at $400,000, which is covered by insurance.

By an intensive campaign lasting less than a week the University of Rochester has raised $800,000 in the city of Rochester alone toward an endowment fund of one million dollars, the interest from which is to be used to increase professors' salaries. Mr. George Eastman, head of the Eastman Kodak Company, subscribed $100,000, the Bausch & Lomb Optical Company gave $75,000 and many other houses sums of lesser amount.

Dr. E. H. Kennard has been appointed assistant professor of physics at Cornell University.

Captain Esbon Y. Titus, formerly chief chemist for Nitrate Plant No. 1, Sheffield, Ala., has been appointed assistant professor of chemistry at the University of Wisconsin.

Francis Marsh Baldwin, Ph.D. (Illinois), assistant professor of zoology at Iowa State College for the past two years, has been raised to the rank of associate professor and has charge of the work in human physiology. Ralph L. Parker, M.S. (Brown), who served overseas for eleven months, is associated with Dr. Baldwin as an instructor.

Stuart Hobbs Sims, associate professor in the department of mechanics and hydraulics at the University of Iowa, will succeed C. B. McCullough as head of the department of civil engineering at the Oregon Agricultural College. Mr. McCullough has been appointed state highway bridge engineer for Oregon.

The Yale School of Forestry has received from Mrs. Claire K. Williams, of Lakeville, Conn., her interest in a pension fund of ten thousand dollars. This fund is given as a memorial to her son, Herbert C. Williams, who graduated at the School of Forestry as a loan for needy students.

DISCUSSION AND CORRESPONDENCE

AN APPEAL

During the night of November 27 fire completely destroyed McCoy Hall, formerly the administration building of the Johns Hopkins University, and immediately occupied by the Federated Charity Organization of the City of Baltimore, and certain departments of the

school of hygiene and public health of Johns Hopkins University. About three weeks ago the writer moved his department, that of biometry and vital statistics in the school of hygiene, into McCoy Hall, occupying the whole of the second floor of that building. On Thanksgiving Eve the writer had completed the removal to this building of all his private scientific library comprising roughly some fifteen thousand reprints and pamphlets. In the fields of biometry and genetics this library was in some respects unique owing to the fact that the writer began his activities in the field of biometry nearly twenty years ago when that branch of biological science was just getting under way, and consequently there was a completeness to the collection in that field which makes its total loss a catastrophe of overwhelming significance to the writer's scientific work.

In addition all the accumulated unpublished records of the writer's work for the past twenty years were completely destroyed. This included the records of his work in the genetics of poultry for ten years at the Maine Agricultural Experiment Station.

This second loss is, of course, wholly irremediable. The purpose of this note is to appeal to workers in the fields of genetics, biometry and vital statistics, to help in remedying the first loss in so far as it can be remedied by sending to the writer duplicates of such of their reprints as they may have available and which they were kind enough to send him before. Any help in this direction will be deeply appreciated.

RAYMOND PEARL
SCHOOL OF HYGIENE AND PUBLIC HEALTH,
THE JOHNS HOPKINS UNIVERSITY

SOMATIC VARIATION

THE undersigned are making a study of somatic variation, using for this purpose the duplicated portions of double monsters. We are especially interested at the present time in securing photographs or accurate sketches showing the color markings on double-headed calves or other double monsters in mammals characterized by color patterns. Any information as to the existence of such specimens from which records of this nature might be obtained would be greatly appreciated.

LEON J. COLE,
JESSIE MEGEATH
DEPARTMENT OF GENETICS,
UNIVERSITY OF WISCONSIN

STEINDACHNERIDION

IN 1888[1] we created the genus *Steindachneria* for three species of large catfishes from eastern Brazil; *St. amblyura* E. and E., from the Rio Jequitinhonha, *St. doceana* E. and E., from the Rio Doce and *St. parahybæ* Steindachner, from the Rio Parahyba. Our attention was at once called to the fact that Goode, in Agassiz' "Three Cruises of the Blake," had mentioned with a brief description and no type, if we recall correctly, a Macrurid under the name *Steindachneria.* With the rules governing nomenclature in those benighted times Goode's name had no standing and we wrote Goode calling his attention to the fact. Goode replied October 1, 1888: "*Steindachneria* has never been published, though the diagnosis of the genus has been lying in manuscript for nearly two years. So we will change the name. It is not of the least consequence."

When Goode and Bean's "Oceanic Ichthyology" was issued it appeared that Goode's intentions in regard to the Macrurid *Steindachneria* had not been carried out. Thereupon[2] we proposed the name *Steindachnerella* for the Macrurid.

Times and rules have changed. Dr. David Starr Jordan recently wrote us the catfish must have a new name. We sent him the letter of G. Brown Goode whereupon Jordan replies, "Goode's letter is very nice and characteristic. But under our present rules a *nomen seminudus* holds. . . . I recommend that you give a new name to the South American genus."

Reluctantly and with effort we submit to changing opinion, realizing that it is a long time since we began to give names to the fresh water fishes of South America. There-

[1] *Proc. Cal. Acad. Sci.* (2), I., 137.
[2] *Am. Naturalist*, 1897, p. 159.

fore, under the name *Steindachneridion* we rebaptize those catfish which, for thirty-one years have been nozing around on the river bottoms just north of Rio Janeiro under the improper appelation *Steindachneria*.

Carl H. Eigenmann,
Rosa Smith Eigenmann

ACOUSTIC EFFECTS OF WIRES

The thorough researches of Wallace C. Sabine, of Harvard University, showed that the acoustic qualities of a room depend largely on its reverberation times for various pitches, that is, the intervals during which the repeated echos of sounds remain audible. Good corrections can usually be made by altering the sound-absorbing qualities of walls and other surfaces against which the sound waves impinge and by which they are wholly or partially reflected.

Many attempts have been made, some within very recent times, to correct faulty rooms by stretching wires across them. There seems to be no reason for supposing, a priori, that a correction can be obtained in this way. To my knowledge no quantitative experiments to settle the question have been recorded. Many architects who have not given careful attention to the work of Sabine are inclined to believe that this method, because it has been used in so many instances, must give some degree of correction.

In the course of some experiments which I made a few months ago on the faulty acoustics of the chamber of the House of Representatives in the new parliament buildings in Wellington, New Zealand, I was requested to make an experiment on the effect of wires. The committee in charge of the work knew that a chamber in the Australian parliament buildings had been fitted with wires and that they were said to function well.

No. 16 copper wires were stretched both lengthwise and crosswise six inches apart in a horizontal plane over the entire middle part of the room bounded by the galleries. This space constitutes two thirds of the cross-section of the room. 9,000 feet of wire were used, possibly twenty times as much as would ordinarily be used in a room of this size. The reverberation times for a great variety of pitches were carefully measured both with and without wires, and were found to be the same in both cases to within about two per centum, which is not greater than the expected error of measurement.

In this particular case, therefore, the wires were without effect. I have not been able to discover any uniformity in the arrangements of wires where they have been used, and so the one described above may be considered as good as any. The probability is great that wires, however arranged, have no effect on acoustics.

Harry Clark
Oberlin College

QUOTATIONS

THE HARVEIAN FESTIVAL OF THE ROYAL COLLEGE OF PHYSICIANS OF LONDON

The Harveian Festival was, for the first time since 1913, celebrated with full honors by the Royal College of Physicians of London on St. Luke's Day (October 18). The Harveian Oration has been delivered each year, but the other ceremonies have been intermitted. On this occasion the oration, delivered by Dr. Raymond Crawfurd, dealt with the forerunners of Harvey in antiquity. As will be seen when the full text is published in an early issue, the speaker supported the thesis that in the matter of the circulation of the blood Harvey's indebtedness to any but Aristotle was negligible. The fuller knowledge now possessed of the writings of men of science of ancient days demanded, he said a readjustment of traditional beliefs, for too much had been claimed for the ardent anatomists of the Renaissance and too little conceded to the master minds of antiquity. The oration was delivered in the library, and the speaker's development of his theme was closely followed by a large and attentive audience. Afterwards the President presented the Baly Medal to Dr. Leonard Hill, and in doing so recalled the circumstances of its foundation. William Baly was assistant physician to St. Bartholomew's Hospital, a Fellow of the

Royal Society as well as of the Royal College of Physicians, and had attained a leading position in London when he was killed in a railway accident in 1861. Five years later Dr. Dyster presented a sum of money to the college to found a medal in Baly's memory, to be given every two years to the person deemed to have most distinguished himself in the science of physiology, especially during the two years preceding the award of the medal. The first recipient was Richard Owen; among the others were William Sharpey, Charles Darwin, Sir David Ferrier, Sir Michael Foster, Dr. W. H. Gaskell, Sir Edward Sharpey Schafer, Professor E. H. Starling, Professor Halliburton, Dr. J. S. Haldane, Professor Gowland Hopkins, and Professor W. M. Bayliss. But the medal is not restricted to British subjects, and has been awarded at various times to Claude Bernard, Carl Ludwig, R. Heidenhain, M. Schiff, Professor Pavloff (the Russian physiologist), and Professor E. Fischer. Harvey, in giving the college his patrimonial estate of Burmarsh, in Kent, in 1656, just a year before his death, enjoined that once every year a general feast should be held within the college, and that on that day an oration should be delivered exhorting the fellows and members to search and study out the secrets of Nature by way of experiment, and also, for the honor of the profession, to continue in mutual love and affection among themselves, ever remembering that *concordia res parvæ crescunt, discordia magnæ dilabuntur.* It has been the practise of the college to obey this injunction by holding a dinner of the fellows, to which the guests are invited, on St. Luke's Day. Such a dinner was held on October 18. The President (Sir Norman Moore), in proposing a toast to the guests, dealt briefly with the changes and terrible events of the years since 1913, and remarked incidentally that the college had been prevented from celebrating as it would have wished the quatercentenary of its foundation, which fell on September 28, 1918. In happy sentences, illumined by many historical references, he showed how the college had always manifested its attachment to literature. He reminded hearers that Linacre—who, with the aid of Cardinal Wolsey, obtained from Henry VIII. the charter of incorporation—was one of the earliest Greek scholars in this country, and the friend of such men as Erasmus, More and Tunstall. Ever since the college had shown its attachment to learning, and had never wanted among its fellows men of literary distinction and wide scholarship. The toast was acknowledged by Sir J. J. Thomson, President of the Royal Society, who vindicated the claims of medicine to be accounted an independent science, bringing to its task for the prevention and relief of human suffering special methods of observation and experiment, upon which the art of the physician is founded. The toast was acknowledged also by Mr. J. C. Bailey, the editor of Cowper. The health of the Harveian orator was given in a brilliant and sympathetic speech by the senior censor, Sir Wilmot Herringham, and briefly acknowledged by Dr. Crawfurd.—*The British Medical Journal.*

SCIENTIFIC BOOKS

Konchûgaku Hanron Jôkwan (*General Treatise on Entomology*). By. DR. T. MIYAKE. Shokabo, Nihonbashi, Tokyo, Vol. II., 1919.

IN SCIENCE for August 3, 1917, is published a brief review of the first volume of this excellent work by Dr. Miyake, of the Imperial Agricultural Experiment Station at Nishigahara, Tokyo. The second volume has just appeared, and includes a discussion of insects' relations to plants, animals and man, with methods of general study, classification and collecting. It also includes a history of entomology in foreign countries and also in the older days in Japan. Although published in Japanese, much of it will be intelligible to the American reader through the abundant illustrations, which, of course, constitute a universal language. Dr. Miyake expects to publish two additional volumes, and the work as a whole will be an admirable compendium for the students of entomology in Japan. He has done pioneer work in many directions, the educational value of which is very high.

L. O. HOWARD

SPECIAL ARTICLES

GERMINATING FRESHLY HARVESTED WINTER WHEAT

Frequently only a small percentage of freshly harvested winter wheat germinates readily under the conditions ordinarily used in making the germination tests even though it would germinate well under these same conditions a few weeks later. In sections of the country where farmers depend upon wheat from the current crop for the fall sowing the poor germination secured with the fresh grain has made it difficult for seed analysts to give accurate information as to the quality of winter wheat offered for seed in time for this information to be of service.

In a recent investigation by the Seed Testing Laboratories of the United States Department of Agriculture it has been found that the difficulty described in the preceding paragraph can be almost entirely overcome even with wheat taken from standing plants and never allowed to dry out by the use of a lower temperature than has been customary for making the germination tests. Thus of 16 samples of freshly harvested wheat an average of 99 per cent. began to germinate in 5 days at temperatures from 9° to 16° C. (48° to 61° F.), whereas in the same time an average of only 86 per cent. germinated at 22° C. (72° F.) which is about the temperature at which germination tests of wheat are frequently made. In the case of one lot 98 per cent. were germinating by the end of 5 days at 12° C. (54° F.) and only 16 per cent. at 22° C. (72° F.). About 15° C. (59° F.) is recommended for use in making germination tests of all freshly harvested wheat. Of course at this temperature the rate of growth is slow after germination has begun. However, if one wishes to assure himself of the normal character of the seedlings it is only necessary to transfer the wheat grains as soon as the coverings are split over the embryo to some place where the temperature is about 20° C. (68° F.) and leave them at the higher temperature for a day or two.

A number of other methods have been discovered of overcoming this difficulty, at least partly, but none is as satisfactory as the use of a low germination temperature. Removing the coats over the embryo by the use of concentration sulphuric acid, followed by neutralization of the acid and washing, and a number of mechanical treatments which consist essentially of exposing the embryo to external conditions have been markedly successful, but are all tedious and some of them are attended with great danger of subsequent decay of the grain.

Drying the wheat at about 40° C. (105° F.) for a week had a somewhat beneficial effect upon its germination, but this method of treatment does not give wholly satisfactory results and, together with the following germination test, consumes more time than can be allowed, especially toward the end of the fall sowing season.

All of the methods which were beneficial with winter wheat gave equally good results with spring wheat and all except treatment with sulphuric acid were used with more or less success also in the germination of freshly harvested barley and oats, with which the same difficulty may be experienced as with wheat.

A full report of the investigation is to be published shortly by the United States Department of Agriculture.

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